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☐ 1. 8/34/1 (Item 1 from file: 351)

003471013

WPI Acc No: 1982-18959E/ 198210

Electrophotographic transfer component - with tackifier

layer produced by adding curing agent and tackifier to room temp. curing or heat fusing liq. silicone rubber

Patent Assignee: RICOH KK (RICO )

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 57019753	A	19820202				198210 B

Priority Applications (No Type Date): JP 8094449 A 19800710

Patent Details:

Patent No	Kind	Lan Pg	Main IPC	Filing Notes
JP 57019753	A	6		

Abstract (Basic): JP 57019753 A

Electrophotographic transfer component contains a tackifier layer which is produced by adding a curing agent and tackifier to (A) two-parts addn. type room temp.-curing or heat-fusing silicone liq. raw rubber, applying the mixt. to one side of a base and then curing the coated layer at room temp. or under heating. The tackifier is (a) mono- or two-bath condensn. type silicone varnish, opt. modified, (b) two-bath condensn. type room-temp.-curing or heat-curing silicone liq. raw rubber, (c) methyl-, phenyl-, vinyl-, phenylvinyl-, fluoro or nitrile- silicone solid raw rubber of (d) silicone oil having a viscosity of above 10,000 cP.

The components (a) are, e.g., methylsilicone varnish or methylphenyl silicon varnish. The component (b) consists of diorgano polysiloxane e.g., OH gp.-sealed dimethyl polysiloxane, a crosslinking agent and opt. filler. The components (c) are, e.g., diorganopolysiloxane, methyl silicone raw rubber, vinyl silicone raw rubber, etc. The components (d) are, e.g., methylsilicone oil, methylphenyl silicone oil, etc. The raw rubber (A) consists of diorganopolysiloxane, crosslinking agent and if necessary filler. The curing agents are, e.g., Pd, Pt, platinum carbon, etc. The amt. of tackifier is 2-90, esp. 3-70 wt.% in the component.

The electrophotographic transfer component has continuous tackiness, and is suitable for transfer of toner. It has good releasing properties and excellent cleaning properties.

Derwent Class: A26; A89; G08; P84

International Patent Class (Additional): G03G-007/00

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□ 2.

**8/34/2 (Item 2 from file: 347)**  
00869453 \*\*Image available\*\*

**MEMBER FOR ELECTROPHOTOGRAPHIC TRANSFER****Pub. No.:** 57-019753 A ]**Published:** February 02, 1982 (19820202)**Inventor:** NAMIKI RYOICHI**Applicant:** RICOH CO LTD [000674] (A Japanese Company or Corporation), JP (Japan)**Application No.:** 55-094449 [JP 8094449]**Filed:** July 10, 1980 (19800710)**International Class:** [ 3 ] G03G-007/00**JAPIO Class:** 29.4 (PRECISION INSTRUMENTS -- Business Machines)**Journal:** Section: P, Section No. 116, Vol. 06, No. 82, Pg. 115, May 20, 1982 (19820520)**ABSTRACT**

**PURPOSE:** To provide sustaining tackiness and releasability fit for the transfer of a toner by using a silicone tacky layer containing a silicone tackifier.

**CONSTITUTION:** The base materials of the tacky layer are diorganopolysiloxane represented by general formula I or II and 2-pack addition type cold-setting or thermosetting liquid raw silicone rubber containing a crosslinking agent. In the formulae R is methyl, phenyl or the like, and each of m and n is an integer of  $\geq 1$ . To the base materials are added a setting agent and a tackifier selected from a group of (a)- (d), and the mixture is applied to a substrate and set at ordinary temperature or by heating to form a tacky layer. Said group consists of (a) 1- or 2-pack condensation type silicone varnish or its modification product, (b) 2-pack condensation type cold-setting or thermosetting liquid raw silicone rubber, (c) solid raw methyl-, phenyl-, vinyl-, phenylvinyl-, fluoro- or nitrile-silicone rubber and (d) silicone oil with  $\geq 10,000$  cps viscosity.

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□ 3.

**8/34/3 (Item 3 from file: 345)**

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Basic Patent (No, Kind, Date): JP 57019753 A2 820202

**PATENT FAMILY:****JAPAN (JP)**

Patent (No, Kind, Date): JP 57019753 A2 820202

MEMBER FOR ELECTROPHOTOGRAPHIC TRANSFER (English)

Patent Assignee: RICOH KK

Author (Inventor): NAMIKI RIYOUICHI

Priority (No, Kind, Date): JP 8094449 A 800710

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Japan, Kokai

57-19753

MEMBER FOR ELECTROPHOTOGRAPHIC TRANSFER

[Denshi Shashin Tensha Yo Buzai]

Ryoichi Namiki

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C.

March, 2002

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<u>Document No.</u>	:	57-19753
<u>Document type</u>	:	Kokai
<u>Language</u>	:	Japanese
<u>Inventor</u>	:	Ryoichi Namiki
<u>Applicant</u>	:	Ricoh Co., Ltd.
<u>IPC</u>	:	G 03 G 7/00
<u>Application date</u>	:	July 10, 1980
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<u>Foreign Language Title</u>	:	Denshi Shashin Tensha Yo Buzai
<u>English Title</u>	:	MEMBER FOR ELECTROPHOTOGRAPHIC TRANSFER

1. Title of the Invention: MEMBER FOR ELECTROPHOTOGRAPHIC  
TRANSFER

2. Claim

1. A member for an electrophotographic transfer characterized by the fact that a curing agent and a tackifier selected from the following groups are added to a two-liquid addition type cold-setting or thermosetting silicone liquid raw rubber, spread on one surface of a base material, and cured at normal temperature or thermally cured, so that a tacky layer is formed.

a) One-liquid or two-liquid condensation type silicone varnish or its modified product

b) Two-liquid condensation type cold-setting or thermosetting silicone liquid raw rubber

c) Methyl-, phenyl-, vinyl-, phenylvinyl-, fluoro- or nitrile-silicone solid raw rubber

d) Silicone oil with a viscosity of 10,000 cs or more

3. Detailed explanation of the invention

The present invention pertains to a member for an

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<sup>1</sup>Numbers near the margin indicate pagination in the foreign text.

electrophotographic transfer having a silicone group tacky layer on the surface.

In the electrophotography including a transfer process, basically, an electrostatic latent image is formed on a photosensitive body by charging and image exposure and developed by coloring resin particles called a toner, and a toner image obtained is transferred and fixed onto a transfer sheet. As a transfer means being used in the method, a pellet-shaped transfer member as shown in the attached figure (in the figure, 1 is a charging system, 2 is an exposure system, 3 is a developing system, 4 is a photosensitive body, 5 is a transfer member, 6 and 6' are transfer and fixing rollers, 6 is a fixing roller in which a heater is built, 7 is a press roller, 8 is a transfer sheet, 9 is a cleaning roll, and 10 is a toner) is known. In the member for transfer, a coating layer of a silicone rubber is installed on a pellet-shaped base material such as fabric and plastic sheet, and a toner image 10 formed on a photosensitive body drum 4 is transferred onto a silicone rubber layer of the transfer member by the tackiness of the silicone rubber through the rotation of the drum. The image transferred is melted by heating according to the hot roller 6, separated from the silicone rubber

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resin by the releasability of the silicone rubber, retransferred onto the transfer sheet, and fixed.

However, in the conventional transfer member, the tackiness of the silicone rubber coating layer was weak, and there was no



its retention. In addition, if the tackiness was raised, the releasability and the cleanability of a toner were deteriorated.

The purpose of the present invention is to provide a member for an electrophotographic transfer having both sustainable tackiness and releasability suitable for the transfer of a toner and also having good toner cleanability.

In other words, the transfer member of the present invention is characterized by the fact that a curing agent and a tackifier selected from the following groups are added to a two-liquid addition type cold-setting or thermosetting silicone liquid raw rubber, spread on one surface of a base material, and cured at normal temperature or thermally cured, so that a tacky layer is formed.

a) One-liquid or two-liquid condensation type silicone varnish or its modified product

b) Two-liquid condensation type cold-setting or thermosetting silicone liquid raw rubber

c) Methyl-, phenyl-, vinyl-, phenylvinyl-, fluoro- or nitrile-silicone solid raw rubber

d) Silicone oil with a viscosity of 10,000 cs or more

The two-liquid addition type cold-setting or thermosetting silicone liquid raw rubber being used in the present invention becomes a base material of a tacky layer of the transfer member of the present invention and is defined as follows. In other words, the raw rubber is mainly composed of diorganopolysiloxane (base oil) represented by the following formula containing

unsaturated groups such as vinyl group and allyl group in the molecule, crosslinking agent, and if necessary, filler such as silica and clay, is cured at normal temperature or higher temperature in the presence of a curing agent, and generates a silicone rubber with a two-dimensional long chain-shaped structure (and sometimes, can include a silicone resin with a three-dimensional networked structure).

(R = methyl, phenyl, etc., and m = an integer of 1 or more.)

(R = methyl, phenyl, etc., and m and n are integers of 1 or more.)

As the crosslinking agent, siloxane containing Si-H and Si-CH<sub>3</sub> groups as represented by the following formulas:  
copolymerized siloxane having

(m' = an integer of 1 or more.)

( $m'$  = an integer of 1 or more.),  $(\text{CH}_3)_2\text{SiO}_{1/2}$ , and  $(\text{CH}_3)_2\text{CH}_2=\text{CHSiO}_{1/2}$  as constitutional units and a copolymerized siloxane having  $(\text{CH}_3)_2\text{HSiO}_{1/2}$  as a constitutional unit are used. Here, the amount of crosslinking agent being used as follows. As the relative amount of the reaction component containing SiH and the unsaturated reaction component, one ethylenic bond for one silicon bond hydrogen atom is a theoretical equivalent, and two silicon bond hydrogen atoms are required for saturating one acetylenic bond. However, the equivalent reaction component does not need to be absolutely used, and any of them may be excessive. Therefore, the crosslinking agent at 0.01-2 parts by weight to the base oil at 1 part by weight is used.

In the present invention, a curing agent is used to cure such an addition type silicone raw rubber. As the curing agent, Pd, Pt, platinum black, platinum asbestos, platinum carbon, chloroplatinic acid ( $\text{H}_2\text{PtCl}_2 \cdot 6\text{H}_2\text{O}$ ), etc., are used, and curing is carried out by the addition reaction of the unsaturated groups in the raw rubber and

or

in the crosslinking agent in the presence of such a curing catalyst. The amount of curing agent being used is appropriately

about  $1 \times 10^{-10}$ – $1 \times 10^{-3}$  mole relative to the base oil at 1 part by weight. Said 1 equivalent represents the amount of reaction component corresponding to the ethylenic unsaturation of 1 unit weight or the acetylenic unsaturation of 1/2 unit weight.

As well known, the two-liquid addition type silicone raw rubber is a silicone rubber with excellent heat resistance, water resistance, releasability, mechanical strength, etc. In using the silicone rubber with such performances in the above-mentioned transfer process, the heat resistance and the releasability specific to the silicone rubber are basically required, and the tackiness is required more than that for a tacky transfer. Furthermore, cleanability is also required for removing the remaining toner and other stains. However, the tackiness and the releasability or the cleanability are contradictory to each other, and it was understood that it is necessary to appropriately balance these properties for releasing, tackifying, and cleaning of the toner. In such viewpoints, a tackifier is used together in the present invention, however since the reaction is structurally completed in the addition type silicone raw rubber being used in the present invention, if the crosslinking agent and the curing agent are added to the base oil, the increase and decrease of the crosslinking agent or curing agent only determines the reaction velocity. If it is cured in a rubber shape, there is little difference in the physical properties. Therefore, since the tackiness was very

weak in this state, it was understood that the tackiness and the releasability were more improved by appropriately including the tackifier.

Next, the tackifier being used in the present invention is explained.

First, the one-liquid or two-liquid condensation type silicone varnish is obtained by diluting the following thermosetting polysiloxane having a three-dimensional networked structure to about 50-60% with a solvent such as toluene and xylene, and as its representative examples, methyl silicone varnish and methylphenyl silicone varnish are known.

(However, R represents a methyl or phenyl group.)

In the methyl silicone varnish,  $R = -CH_3$ , and in the methylphenyl silicone varnish,  $R = -CH_2$  and  $-CH_3$ . As these silicone varnishes, there is a type being condensed and cured simply by heating and a type being condensed and cured by heating in the presence of a curing agent such as metal organic acid salt and organoamine (this kind is not used in the present invention).

In the present invention, a modified product of such a

silicone varnish can also be used. The modification is carried out with a resin such as alkyd resin, phenol resin, melamine resin, epoxy resin, polyester, acryl resin, and polyurethane.

Next, the two-liquid condensation type cold-setting or thermosetting silicone liquid rubber is mainly composed of diorganopolysiloxane (base oil) crosslinking agent having reaction groups such as

(R represents an alkyl group.),

and if necessary, a filler such as silica and

clay (in case the filler is included, the rubber is also called a base or compound). It is a type that is condensed and cured at normal temperature or higher temperature in the presence of a curing agent (in the present invention, this kind of curing agent is not used, however it is usually added and cured right before the use) and generates the following rubber with a two-dimensional long-chain structure.

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(R represents methyl, phenyl, vinyl, or alkyl fluoride groups.)

Also, as the condensation reaction, a hydration condensation

reaction between the following silanols by the reaction groups of the base oil, a dealcohol condensation reaction of silanol and alkoxysiloxane, and a dehydrogenation condensation reaction between silane and silanol.

As a detailed example of the base oil, there is a terminal hydroxyl group-sealed dimethylpolysiloxane.

Also, as the crosslinking agent, a trifunctional or tetrafunctional alkoxysilane (for example,  $\text{CH}_3\text{Si}(\text{OC}_2\text{H}_5)_3$ ,  $\text{C}_2\text{H}_5\text{Si}(\text{OC}_2\text{H}_5)_3$ ,  $\text{CH}_2=\text{CHSi}(\text{OC}_2\text{H}_5)_3$ ,  $\text{Si}(\text{OC}_2\text{H}_5)_4$ , and  $\text{Si}(\text{OC}_3\text{H}_7)_4$ ) or these partially hydrolyzed siloxanes, and copolymerized siloxane of  $\text{CH}_3\text{SiO}_{1/2}$  or  $\text{SiO}_2$  unit are used. The amount of crosslinking agent being used is appropriately about 0.05-1.5 parts by weight to the base oil at 1 part by weight. However, since the crosslinking agent is a resin, if it is too excessively included, it is hard and brittle. Thus, it is preferable to optionally mix an

appropriate amount. Also, as the liquid rubber curing agent, though it is not used in the present invention, there are metallic organic acid (for example, tin dibutyl dilaurate, tin dioctenate, iron stearate, and tin octylate), organoamine (for example, dibutylamine, triethanolamine, dimethyl soya amine, and tetramethyl guanidine), ammonium carbonate, tetramethyl ammonium hydroxide, tetramethyl phosphonium hydroxide, etc.

Next, the methyl-, phenyl-, vinyl-, phenylvinyl-, fluoro-, or nitrile-silicone solid raw rubber as the tackifier is a nearly solid raw rubber (see the following formulas) with a viscosity of about several million to 30 million c/s, the degree of polymerization of about 5,000-10,000, and a molecular weight of about  $10 \times 10^4$ - $100 \times 10^4$ , unlike the above-mentioned liquid raw rubber. It is a type that is heated and cured in the presence of organoperoxide, fatty azo compound, sulfur, radiation, etc. In other words, it is a diorganopolysiloxane represented by a general formula.

(R =  $-\text{CH}_3$ ,  $-\text{C}_2\text{H}_5$ ,  $-\text{CH}=\text{CH}_2$ , etc.)

There are a methyl silicone raw rubber (R = methyl in the above-mentioned formula), a vinyl silicone raw rubber (sometimes called a methylvinyl silicone raw rubber)



(x = 0.1-5, y = 99.9-95)

and a phenyl silicone raw rubber (sometimes called a methylphenyl silicone raw rubber).

(x = 5-10, y = 95-90)

or

(x = 5-10, y = 95-90)

There are a phenylvinyl silicone raw rubber (sometimes called a

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methylphenylvinyl silicone raw rubber)

fluorosilicone raw rubber (sometimes called a

methylfluorosilicone raw rubber)

and a nitrile silicone raw rubber to which cyanopropyl ( $\text{CNCH}_2\text{CH}_2-$ ) is added. Also, these raw rubbers can be used as a base or compound by adding a filler such as silica and clay and a heat-resistant stabilizer such as iron oxide, zinc oxide, nickel oxide, and rare-earth element.

Next, the silicone oil is represented by

(R represents a group of methyl, phenyl, etc.)

In accordance with the size of  $n$ , the length of the molecules is determined, and the viscosity is determined. In the present invention, the silicone oil with a viscosity of 10,000 cs or more is used as a tackifier, however its viscosity is preferably higher than that of the base oil (liquid rubber). As its representative examples, there are methyl silicone oil and methylphenyl silicone oil.

In the present invention, in addition to the above

materials, in order to improve the durability, the following silicone oil with a viscosity of 10,000 cs or less or its modified product can be used together as an adjustor. The addition of the adjusting silicone oil is preferable since the characteristics such as releasability and cleanability are further utilized. Its viscosity is generally 10,000 cs or less, and it is preferably lower than the viscosity of the liquid raw rubber. Furthermore, it is preferable to have a functional group, if possible. Also, the amount being added is appropriately 40 wt% or less of the nonvolatile portion of the components except for the oil. Also, each material being used in the present invention can be easily obtained as a product on the market.

As the base material for the transfer member, fabric, plastic sheet, etc., are used, as is conventional.

The transfer member of the present invention is prepared by the above-mentioned method, however it is sometimes required to be heated to distill off the solvent, to accelerate curing, etc. The amount of curing agent required for curing of the raw rubber as the base material has already been mentioned above, and the amount of base material and tackifier is preferably about 10-98 wt% and 2-90 wt% (the tackifier is more preferably 3-70 wt%), respectively. Also, the amount of adjustor being used may be 40 wt% or less of the other components. Also, the thickness of the tacky layer is appropriately about 5  $\mu$  or more.

The transfer member of the present invention is utilized for

tackifying and transfer of the toner, as is conventional, and it can also be utilized for cleaning the remaining toner on the photosensitive body. Also, in this case (as shown in the figure, similarly after the retransfer or sometimes, when the transfer sheet is not sent), the remaining toner attached to the transfer member is cleaned with other appropriate cleaning members (for example, cleaning roll 9), so that it can be recovered to the original state. Also, the transfer member of the present invention is usually used in a pellet shape by applying to the rollers 6 and 6' as shown in the figure. However, after one roller 6' is removed, only the other roller 6 can also be applied in a roll shape.

Next, application examples are shown.

#### Application Example 1

A copolymer of 95 mol% dimethylsiloxane unit and 5 mol% methylvinylsiloxane unit and a methyl hydrogen siloxane homogeneous polymer were mixed at a weight ratio of 90:10, and a Pt catalyst was added to it so that Pt could be  $5 \times 10^{-6}$  mole per 1 equivalent vinyl group. 60 wt% said composition, 30 wt% nonvolatile portion of a methyl silicone varnish (50% toluene

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solution) as a tackifier, and 10 wt% silicone oil with a viscosity of 30 cs as an adjustor were dissolved in an appropriate amount of toluene, spread on one surface of a pellet-shaped base material made of a polyimide film, and dried at 200°C for 1 h, so that a transfer member having a tacky layer with a

thickness of 100  $\mu$  was prepared.

#### Application Example 2

A transfer member was prepared by the same method as that of Application Example 1 except for using a methylphenyl silicone varnish (50% toluene solution) instead of the methyl silicone varnish.

#### Application Example 3

A transfer member was prepared by the same method as that of Application Example 1 except for using 50 wt% two-liquid dealcohol condensation type liquid silicone raw rubber (containing 5 wt% ethyl polysilicate as a crosslinking agent) instead of 30 wt% methyl silicone varnish.

#### Application Example 4

A transfer member was prepared by the same method as that of Application Example 1 except for using a methyl silicone solid raw rubber (TSE200 made by Toshiba Silicone Co., Ltd.) instead of the methyl silicone varnish.

#### Application Example 5

A transfer member was prepared by the same method as that of Application Example 1 except for using a methylphenyl silicone solid raw rubber (TSE201 made by Toshiba Silicone Co., Ltd.) instead of the methyl silicone varnish.

#### Comparative Example 1

A transfer member was prepared by the same method as that of Application Example 1 except for excluding the methyl silicone varnish.

Next, the transfer members obtained in this manner were installed in an electrophotographic copying machine as shown in the figure, and a continuous copying was carried out at a fixing temperature of °C. When their tackiness rate, cleanability, releasability, and life were investigated, the tackiness rate was twice or more excellent in the products of the present invention, compared with the comparative product. Also, the cleanability and the releasability were excellent, and the life was also lengthened. Also, the tackiness rate was calculated from the equation of (the amount of toner transferred onto the transfer member) x 100/(the amount of toner on the photosensitive plate before the transfer). As a result, the products of the present invention were almost 90-100%.

#### Comparative Example 2

The amount of crosslinking agent was respectively changed to 5 wt%, 10 wt%, 15 wt%, and 20 wt%, and the method of Comparative Example 1 was repeated, so that transfer members were prepared. Any of these transfer members was stable in their performances themselves, however both their tackiness and cleanability were poor.

#### 4. Brief description of the figure

The figure is an outlined diagram showing a transfer device using the present invention and conventional transfer members.

- 1           Charging system
- 2           Exposure system

- 3        Developing system
- 4        Photosensitive body
- 5        Transfer member
- 6, 6'   Transfer and fixing rollers
- 7        Press roller
- 8        Transfer sheet
- 9        Cleaning roll
- 10       Toner